Using Aramid Cis-trans Isomerization as a Model for Auxetic behavior

Mahshid Alizadeh [1*], Andreas A.F.M. Kilbinger

[1]University of Fribourg, Faculty of science, Chemistry Department, Chemin du Musée 9, CH-1700 Fribourg

[*]mahshid.alizadeh@unifr.ch

Unlike conventional material, auxetic materials show a negative poisson ratio.[1] They expand perpendicular to the direction in which they are stretched. Several molecular polymeric structures have been proposed as being potentially auxetic.[2,3]

The proposed approach to auxetic materials is based on aramide oligomers. N-substituted (cis-trans) benzanilides might be useful in designing re-entrant structures for auxetic materials.

This project deals with the question whether the cis-trans isomerization of amides can be exploited in the synthesis of auxetic polymeric materials. The following isomerization unit containing polymers were designed for single molecule stretching experiments via AFM. These should serve as models to relate molecular changes to macroscopic movements.To synthesize the polymers shown in figure 1, we designed an isomerizable central unit as a macro-initiator. The approach to synthesize such an ATRP initiator from aramides is shown below. The included cis-segment serves as the mechano-responsive element.

References

[1] Kenneth, E.; Li P.; Griffin, A.; Smith, C. *Macromol. Chem. Phys*. **2005**, 206, 233–239.

[2] Mir M.; Najabat Ali M.; Sami J.; Ansari U. *Adv.Mater* **2014**.

[3] Liu Y.; Hong, Hu;. *Sci. Res. Essays.* **2010**, 5, 1052-1063.

Figures

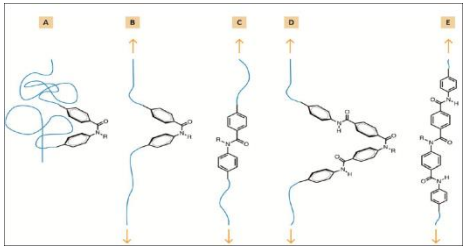

Figure 1: Models for AFM experiments

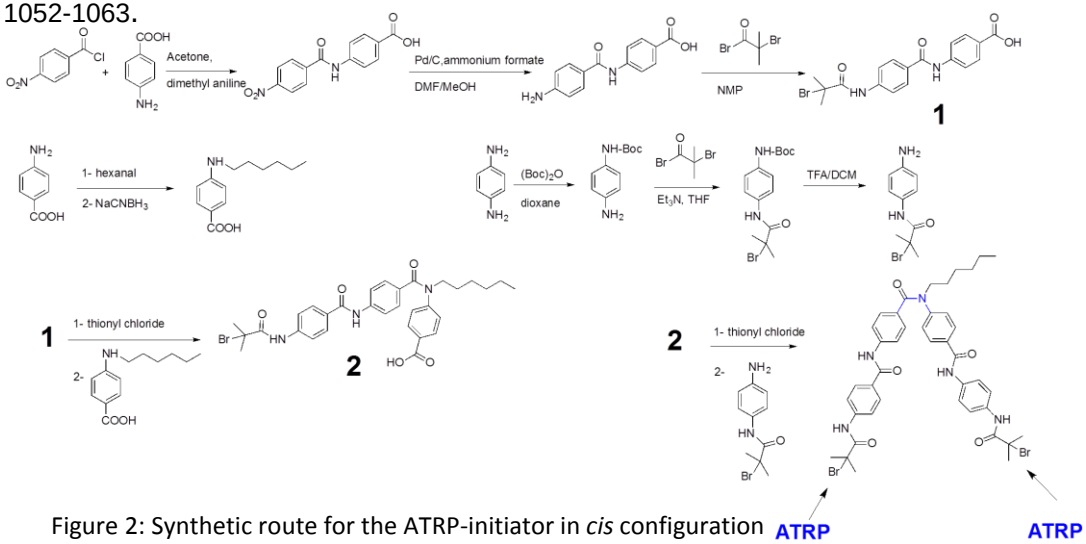

Figure 2: Synthetic route for the ATRP-initiator in *cis* configuration